KRM-X® Duct Smoke Detector

BACnet

Modbus

VdS

- VdS approval (G219046, G219053)
- Patented single tube air sampling system
- Contamination display in %
  and signaling at 70 %
- Electronic air flow control
- Externally operable reset button in housing
- Remote reset option via terminals
- Long service life, alarm threshold tracking
- Bus interface RS485 (-MOD/-BAC only)

Technical Data

|	
Detector type:	RM 3.3-X (ALN-E) scattered light detector
Supply voltage:	**KRM-X-1/KRM-X-1-MOD/ KRM-X-1-BAC:**
	230 V AC ± 10 %, 50/60 Hz
Supply voltage:	**KRM-X-2/KRM-X-2-MOD/ KRM-X-2-BAC:**
	24 V AC (16 – 27,6 V AC) or 24 V DC (21,6 – 27,6 V DC)
Rated current:	KRM-X-1 /KRM-X-1-MOD/ KRM-X-1-BAC: 30 mA KRM-X-2/KRM-X-2-MOD/ KRM-X-2-BAC: 120 mA
Relay outputs:	floating
Alarm relay locked:	1 changeover contact, 8 A, 250 V AC or 24 V DC 1NC contact, 8 A, 250 V AC or 24 V DC
Contamination relay:	1 NC contact, 6 A, 250 V AC or 24 V DC
Operating temperature:	-20 °C – +50 °C
Permissible flow:	1 – 20 m/s
Permissible humidity:	10 – 95 % non-condensing
Protection type:	IP 65
Certification/Approvals:	VdS approval G219046, G219053 DIN EN 54-27
LED display:	% contamination level: flashes at > 70%
LED in housing:	green operational blue lack of airflow yellow failure, electronics, smoke detector defective red smoke alarm including contamination > 99% flashes at attempts to release when detector chamber is not yet cleared
Adapter housing:	ABS
Air measuring tube:	aluminum/plastic shortest length 160 mm standard length 600 mm maximum length: 3009 mm
Dimensions:	approx. 271 x 172 x 85 mm (L x W x H)
Cable gland:	3 x M16

Accessories

Mounting bracket:	KS-X (for insulated / circular ducts) KS-X (for insulated / circular ducts in combination with WDG-X)
Housing:	WDG-X protective insulating housing with alarm display for outdoor installation

Function

The KRM-X duct smoke detector is designed for smoke detection in ventilation ducts. It is a combination of a smoke detector and an adapter system whose measuring tube and housing have been specially adapted for optimal airflow through the smoke detector.
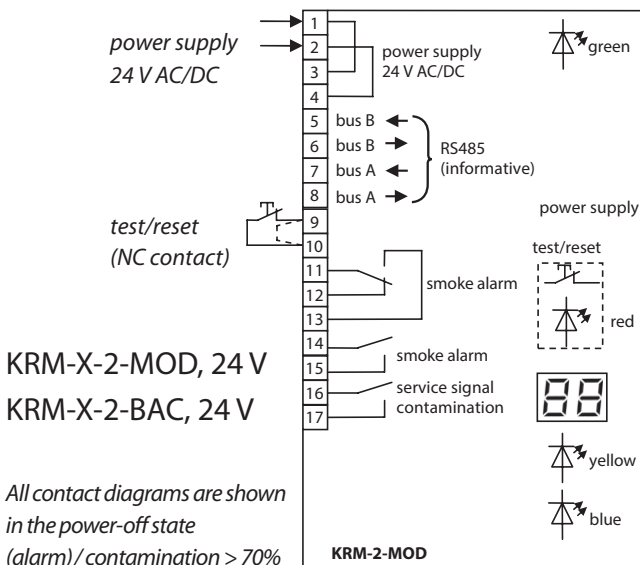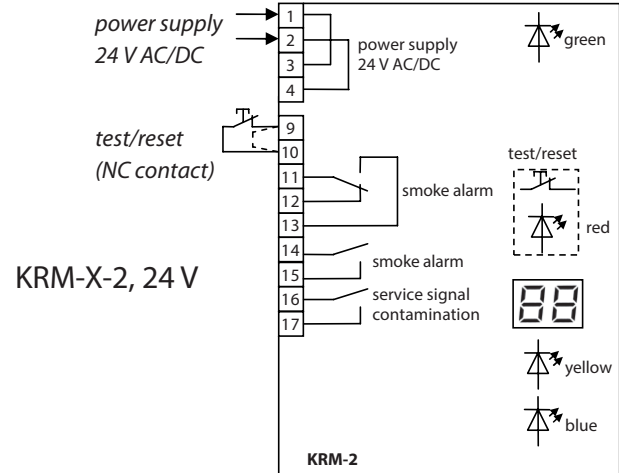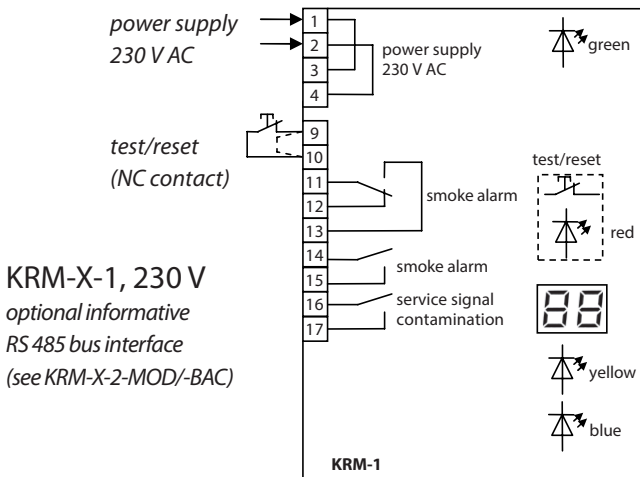
The multi-chamber measuring tube in the air duct carries the air within the air duct along the entire length of the tube, through the detector chamber and back into the air duct. Upon detection of smoke, the detector reacts immediately and triggers an alarm. Over time, the sensor becomes contaminated. Detector sensitivity remains constant up to complete contamination due to alarm threshold tracking. The detector triggers from 70 % contamination upwards, indicating this by flashing. If the detector is not replaced, a smoke alarm is triggered at 99 % contamination. The contamination level is indicated in a two-line LED display, which begins to flash at > 70 % contamination. At the same time the "contamination" relay drops out.

Operability is verified by electronic airflow monitoring, with a blue LED lighting up at < 1 m/s. The failure LED lights up when the smoke detector or the electronic system is defective, and in the absence of a smoke detector. The smoke alarm must be released with the reset button. The same button can be used to perform a functionality test. This test simulates a smoke alarm. The same function is activated on restart, as well as when the bridge circuit between terminals 9 and 10 is opened (remote release).
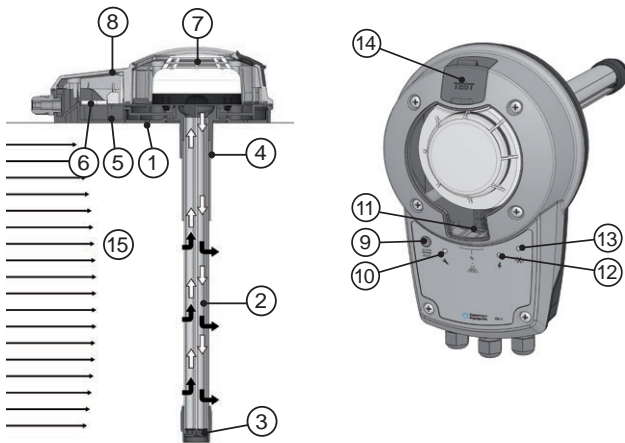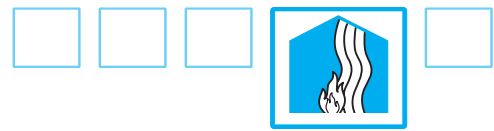
1 Adapter plate with gasket
2 Patented measuring tube
3 End cap
4 Rubber bushing
   (only for insulated or circular ducts)
5 Housing base with gasket
6 Electronics
7 Optical smoke detector
8 Housing top with gasket
9 LED red: alarm/reset button
10 LED yellow: failure
11 LED display: sensor contamination in %
12 LED green: in operation
13 LWD blue: airflow below 1 m/s
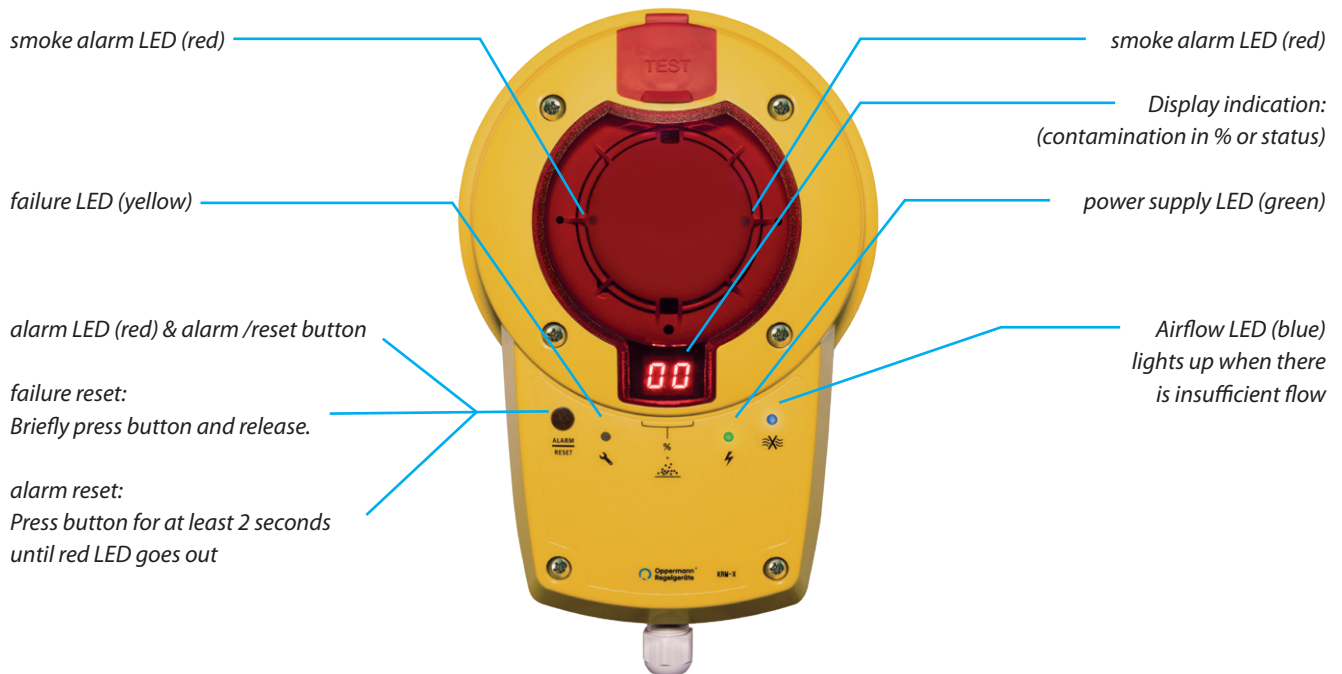14 Opening for test gas
15 Air duct

Electrical connection

KRM-X-1, 230 V
*optional informative
RS 485 bus interface
(see KRM-X-2-MOD/-BAC)*

KRM-X-2, 24 V

KRM-X-2-MOD, 24 V
KRM-X-2-BAC, 24 V

*All contact diagrams are shown
in the power-off state
(alarm) / contamination > 70%*

*Remote reset/test (terminal 9 +10): if bridge circuit is removed,
a floating NC contact must be connected.*

*Note: The floating switching contacts (terminals 11 – 17) should be
assigned as uniformly as possible to an installation category
according to EN 60730-1. These switching contacts are to be used for
230 V AC only for or 24 V AC / DC only. Combinations are not permit-
ted unless at least one contact between different potentials remains
unassigned. Mixed configurations of safety extra-low voltage
(SELV) and low voltage are not allowed. The assembly may only be
operated on one mains phase. Disconnection / Electrical protection
equipment must be provided by the customer.
KRM-X.-1-xx (230 V versions) with a fuse of 16 A;
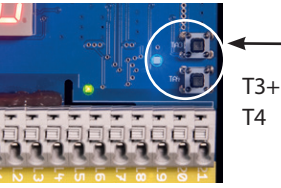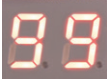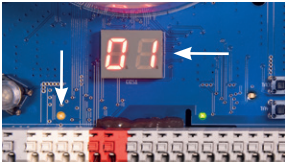KRM-X-2-xx (24 V versions) with 4 A.*

Display and Operation of KRM-X Duct Smoke Detector

smoke alarm LED (red)

failure LED (yellow)

alarm LED (red) & alarm /reset button

failure reset:
Briefly press button and release.

alarm reset:
Press button for at least 2 seconds until red LED goes out

smoke alarm LED (red)

Display indication: (contamination in % or status)

power supply LED (green)

Airflow LED (blue) lights up when there is insufficient flow

Display view	Meaning	Comments
	Start / calibration	Shortly after startup, the software version is displayed (4 digits), e. g. 00 then 20 = software version 0020. With BAC versions are indicated by "bA". At startup or after a power failure, this is followed by a rotating segment display.
00 – 99	Contamination in %	Flashes starting at 70 % (contamination relay drops out); at 99 % the alarm LED alarm lights up.
	Failure	E.g. smoke detector missing, communication with smoke detector disrupted, processor failure. Failure LED & alarm LED light up at the same time. Troubleshooting: Replace detector and confirm by pressing alarm/reset button.
+ All LEDs on circuit board light up	Confirmation of reset / new start	Occurs when alarm/reset button is pressed for more than 8 seconds, or if bridge circuit/ terminal 9/10 is open (missing bridge circuit or remote reset). Display goes out after releasing the alarm/reset button or closing the bridge circuit between terminal 9 + 10.
00 – 99 Flashing	Bus address	Only appears with MOD/BAC versions after pressing the address buttons T3/T4 directly on the circuit board.

LEDs	Meaning	Comments
Alarm / reset (red)	Smoke alarm or failure	**Reset after failure:** Briefly press alarm/reset button. KRM-X restarts immediately. **Reset after alarm:** Press and hold the alarm/reset button for at least 2 seconds until the red alarm LED in the button goes out. Do not release it until then. KRM-X will start again only after release. If the alarm/reset LED continues to flash while the button is pressed, the smoke detector is still filled with test gas/test spray/smoke and cannot be reset. In that case blow out detector out or wait.
Failure (yellow)	Circuit board defective or smoke detector missing	Check/replace circuit board or RM 3.3-X (ALN-E) smoke detector.
Smoke alarm (2 x red)	Smoke alarm or contamination > 99%	Red LEDs directly on the RM 3.3-X (ALN-E) smoke detector. LEDs remain on until reset has taken place.
Power supply (green)	Supply voltage connected	Green LED lights up if supply voltage is connected.
Airflow (blue)	Insufficient airflow	Blue LED lights up when airflow is too low and air relay (only present on DIBt versions) drops out. Check smoke detector position in the duct, check sampling tube (TurboTube) for contamination and clean if necessary.

Programming the bus address and baudrate (Modbus/BACnet versions only):

Display view	Comments
T3+ T4	Press buttons T3+T4 on circuit board (to the right of the display) simultaneously to switch from the contamination display to the bus address display (display flashes).
Display flashes	Use button T3 or T4 to enter the desired address (1–99). The default address on delivery is 99. The display returns to its previous state after 3 seconds without a button being pressed.
	After pressing T3+T4 simultaneously the current bus address is saved and the two underscores appear for about one second.
Display and yellow LED flash	Now the baudrate can be selected (display and yellow LED flash); available baudrates: 01 = 9600 (default) 02 = 19200 03 = 38400 04 = 76800
	After pressing T3+T4 simultaneously once more the current baudrate is saved and the two underscores appear for about one second, after which the device returns to the contamination display.

Note: After 6 seconds without a button being pressed the device returns to the contamination display, and the current value is saved.

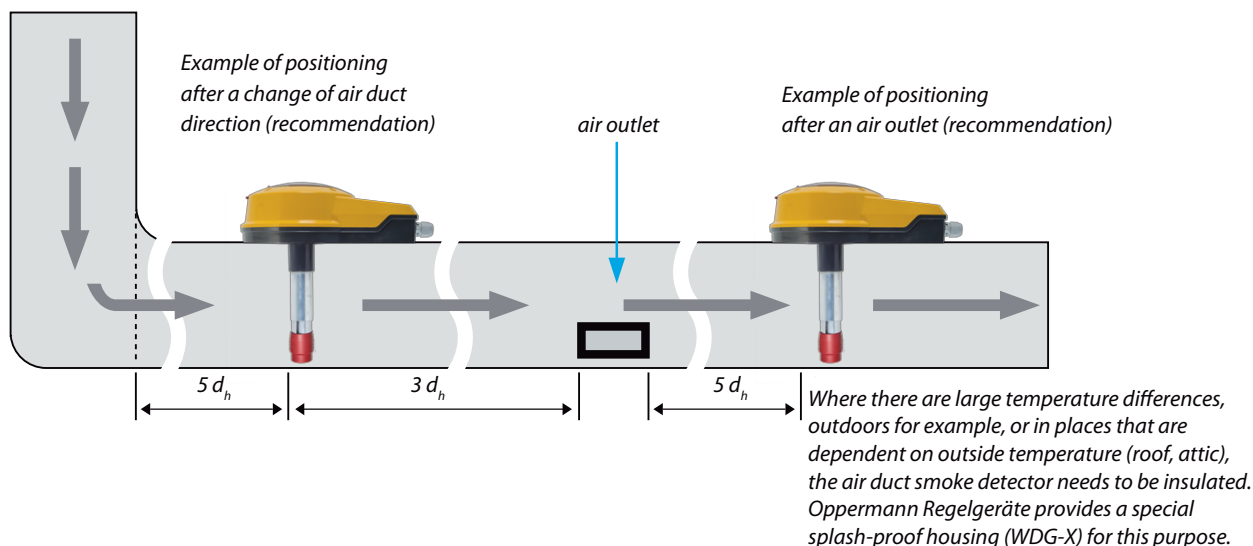# Behavior of the Alarm Relay and Fault Relay and Displays, Plus Reset Options

Valid for software 0020 and higher	In the event of a smoke alarm	In the event of device failure / missing detector
	KRM-X-1 / KRM-X-1-MOD / KRM-X-1-BAC / KRM-X-2 / KRM-X-2-MOD / KRM-X-2-BAC	KRM-X-1 / KRM-X-1-MOD / KRM-X-1-BAC / KRM-X-2 / KRM-X-2-MOD / KRM-X-2-BAC
Alarm relay 11 / 12 / 13	Drops out	Drops out
Alarm relay 14 / 15	Drops out	Drops out
LED **alarm / Reset**	Lights up	Lights up
Fault **relay** 18 / 19	--------- Not present	--------- Not present
Fault **relay**	Stays off	Lights up
Alarm reset or failure reset	Disconnect power or press alarm button or reset via terminal 9/10, provided detector chamber has been cleared.	Disconnect power or press alarm button or reset via terminal 9/10, provided detector chamber has been cleared and fault rectified.

Installation Instructions and Positioning

The KRM-X must be positioned in accordance with the applicable local regulations on ventilation systems. Reliable smoke detection must be ensured. The air collecting tube may be cut to a length of 160 mm, depending on the cross-section of the ventilation duct. It must not be cut to less than this minimum length of 160 mm. Using the KS-X mounting bracket, this makes it possible to monitor ducts up to <100 mm ø. There is no maximum width, height or diameter for air ventilation ducts monitored with the 600 mm long standard air collecting tube under the VdS approval/DIBt certification. The indicated airflow direction must be observed when installing the tube adapter. The air collecting tube may be mounted laterally, below or above the air duct – the location makes no difference.

In the ideal case, as far as is structurally possible, install the KRM-X in a location where flow meters etc. are normally installed, so that there is a laminar airflow along the measuring tube. We recommend mounting and installing the KRM-X at the same distance from heating, cooling and humidity devices and in a similar way as flow sensors. The distance of the KRM-X to fittings, valves, filters, etc. should be 3 times the diagonal of the channel cross-section against the flow direction and 5 times with the flow direction, if this is structurally possible. The KRM-X, including the

Example of positioning after a change of air duct direction (recommendation)

air outlet

Example of positioning after an air outlet (recommendation)

$5\,d_h$ $3\,d_h$ $5\,d_h$

Where there are large temperature differences, outdoors for example, or in places that are dependent on outside temperature (roof, attic), the air duct smoke detector needs to be insulated. Oppermann Regelgeräte provides a special splash-proof housing (WDG-X) for this purpose.
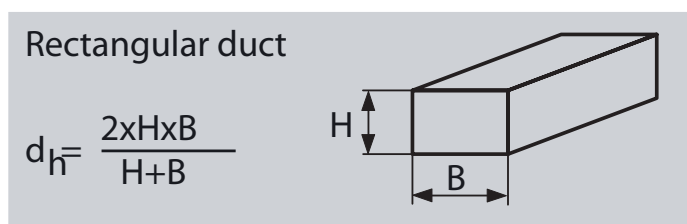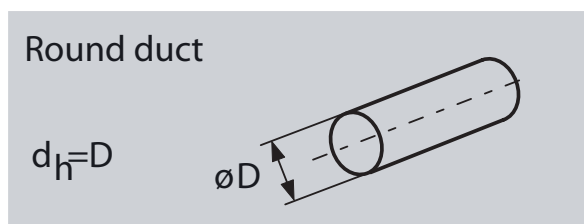
air collecting tube, may not be installed along the longitudinal edges of ventilation ducts (corner area). The KRM-X must be installed such that the air collecting tube is constantly located in the air stream. In horizontal ventilation ducts the KRM-X, including the air collecting tube, should be installed in the upper third of the ventilation duct or at the top of the ventilation duct, if this is structurally possible.

If the positioning recommendations cannot be followed for structural reasons, the KRM-X should be mounted such that reliable smoke detection and airflow are nonetheless ensured. The blue airflow LED serves as an airflow indicator (the LED is off with sufficient flow).
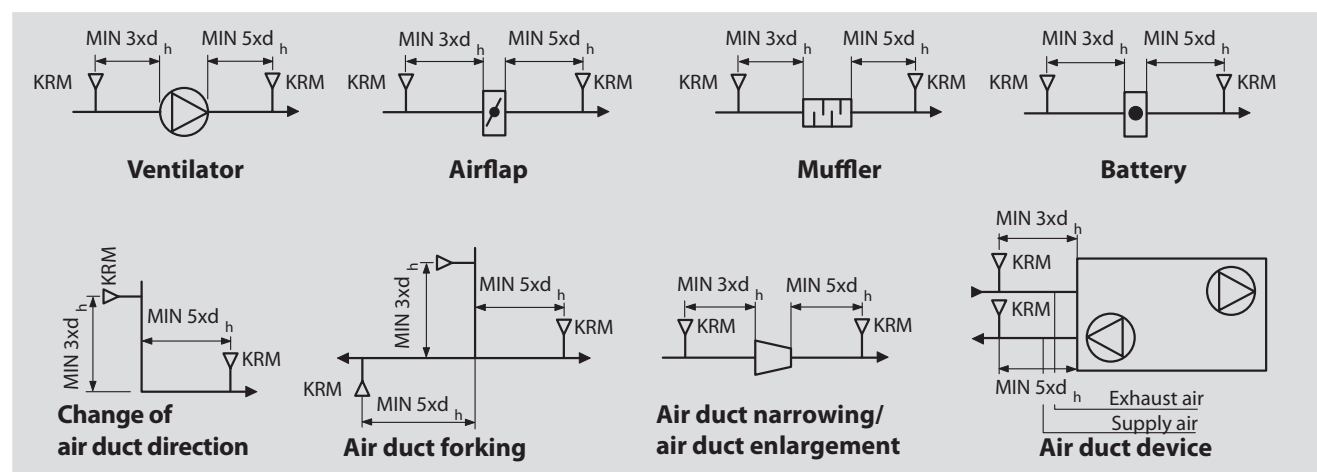
Observe these instructions. All work (such as installation, electrical connection, startup, operation, and maintenance) must only be performed by sufficiently qualified tradesmen. The respectively applicable local rules and regulations (e.g. national building codes, electrical/VDE regulations, etc.) must be observed. Install-

ers and operating entities are required to sufficiently familiarize themselves before startup. Read the product description before operating the equipment. Verify that the product can be used for the relevant application without restrictions. We are not liable for printing errors and changes after printing. Appropriate use implies compliance with operating and installation instructions. We are not liable for losses due to inappropriate use. Unauthorized manipulations or modifications of the device render the operating permit, the product warranty and warranty claims null and void.

Hydraulic diameter d_h

Round duct

$$d_h = D$$

Rectangular duct

$$d_h = \frac{2 \times H \times B}{H + B}$$

Example of positioning (recommendation)

MIN 3xd_h MIN 5xd_h

Ventilator

Airflap

Muffler

Battery

Change of air duct direction

Air duct forking

Air duct narrowing/ air duct enlargement

Exhaust air
Supply air
Air duct device

Installation

min. 145 mm

Caution: operation without end plug not allowed

1.

Drill a hole 43 – 44 mm in diameter at the intended mounting location.

Note: The TurboTube measuring tube can be installed on top or at the bottom or side of the duct for all duct cross-sections (including round ducts).

Minimum length 160

Cutting length of aluminum tube 145

2.

- Determine how long the measuring tube must be.
- If necessary, shorten the tube; minimum length 160 mm including end plug (cutting length 145 minimum – see drawing).
- Deburr the cutting face and put the end plug back on **up to the stop collar**.

Note: The KRM-X must only be used with the red end plug. Observe the mark on the end plug indicating the flow direction.

3.

- Determine the direction of flow and mount the adapter plate such that the line on the adapter plate under the text "Strömungsrichtung" is parallel to the flow direction.
- Four self-tapping screws (not included in delivery) serve for attaching the adapter plate to the sheet metal duct.

ST 3.5
D=8 d=4

Strömungs-richtung

Direction of Flow

4. Installation on the duct

- Rectangular air duct – see picture on the right
- For installation on a circular air duct, use the KS-X-type mounting bracket and the rubber bushing. The mounting bracket has bend perforations for adaption to a round duct.

*The KS-X-type mounting bracket is supplied flat.*

Mounting bracket

④

④ *Rubber bushing*

inside   outside
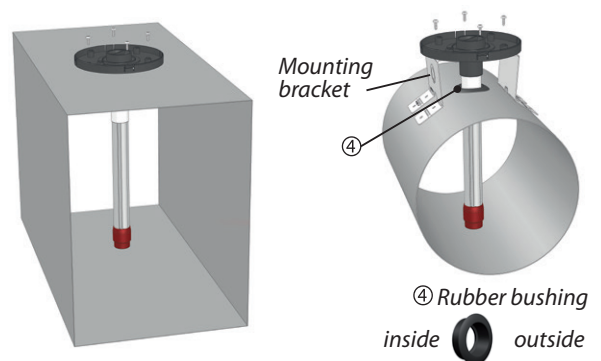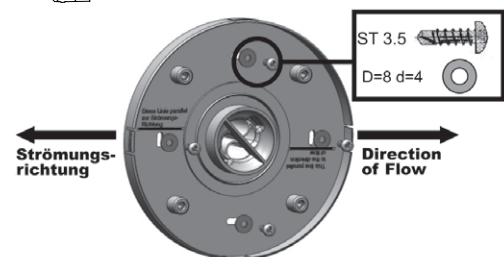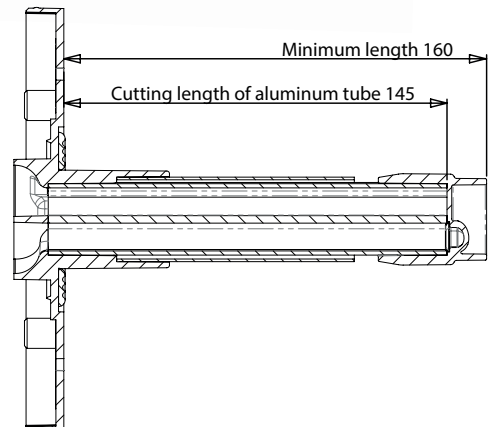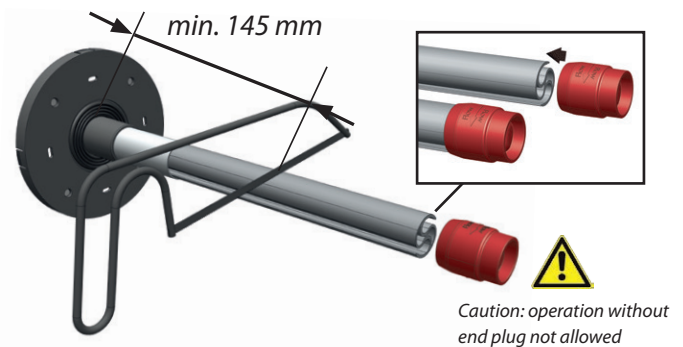
5. Installation on air ducts with insulation

- Use the rubber bushing and insert it into the ø 43 – 44 mm opening in the air duct.
- Install the mounting bracket.
- Insert the assembled adapter plate together with the measuring tube by sliding the measuring tube through the bushing, and screw the adapter plate onto the mounting bracket using 4 self-tapping screws. Then the insulation can be installed.

Mounting bracket

Insulation

④
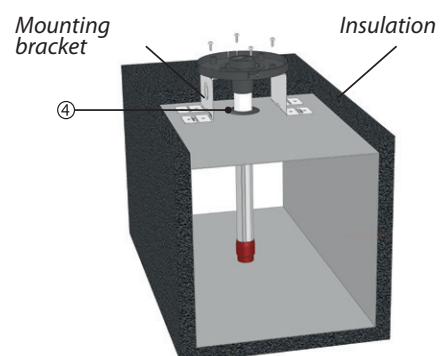
6. Installation outdoors or in a cold environment

- A special WDG-type splash-proof housing is available for protection of smoke detectors exposed to the open air or a cold environment. This housing prevents the warm air in the smoke detector duct from condensing. The interior of the housing is insulated with foam rubber.
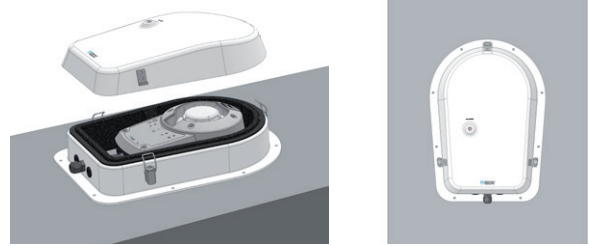
7. Installing the housing with the sensor

- Attach the housing base with the electronics and sensor to the adapter plate. The housing can be attached in any of the four orthogonal orientations. The direction of the housing has no effect on the measurement result. You can optimally align the housing with the sensor.
- Wire the device according to the applicable circuit diagram.
- **Caution:** Wiring and electrical connections may only be done by a duly qualified electrician.
- Make sure that all cables are connected in accordance with the applicable electrical regulations. The cable jacket must reach as close as possible to the terminal block. Wires longer than 10 mm must be fixed near the terminal block using a cable clip or the like or must be insulated in pairs with a suitable protective tube (see application example).
- Check that the gaskets in the housing top are correctly positioned.
- Complete the installation by snapping on and tightening the housing top (ensuring that the catch at the lower end of the housing snaps in correctly; **observe the specified mounting torque of 1.2 Nm**).
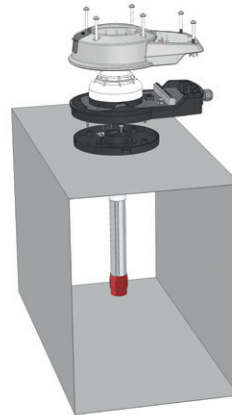
wiring example:

8. Testing the duct smoke detector

- After completing the installation work, properly wiring the device (please note the separate data sheets / circuit diagrams) and applying power, the duct smoke detector is operational.
- The green LED (12) lights up.
- Press the alarm / reset button (9) to perform a simple initial functional test. All LEDs must light up and all relays drop out. **The units connected to the relays are activated!** The display (11) indicates the current degree of sensor contamination. On releasing the button, all LEDs go out except for LED (12), which shows the supply voltage, and the relays pull in. A test opening (14) is available for testing the duct smoke detector. Open the test hole plug. Then spray test spray into the test opening until the smoke detector triggers. Take care not to apply too much test spray, since this would contaminate the smoke detector, possibly causing it to indicate a higher contamination level after the next start or reset.
- **Caution:** Take care to close the test hole opening after the test to prevent the smoke detector from drawing in false air. False air could prevent the smoke detector from triggering when it should. The alarm/reset button lights up, and the relays drop out. The electronic system goes into alarm state and locks up. Press the alarm/reset button to release it. **The sensor must be free of smoke and test gas during reset.** If there is still test gas in the chamber, the device will indicate a higher contamination level. In this case, wait a while and then perform a reset by disconnecting the voltage or perform an external reset. If necessary, remove the housing cover and blow out the smoke detector.
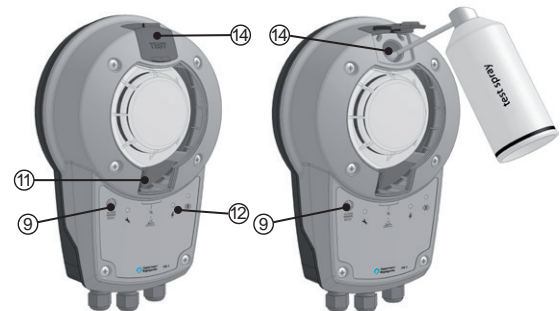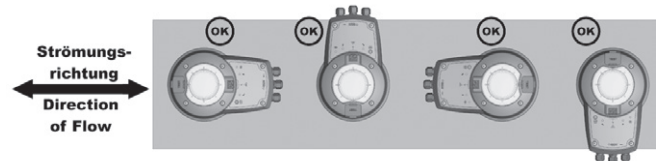
Use the test opening for performing the functional test. **Caution:** The test opening should always be closed during operation, as this would otherwise prevent smoke detection!

9. Final review

- Are all screws tight?
- Is the adapter plate properly mounted in terms of flow direction?
- Are all gaskets in the correct position?
- The blue LED must not light up when airflow > 1 m / s during operation.

[1] The WDG-X special housing is not covered by the VdS approval.

Maintenance and repair

1. Instructions for Operation and Maintenance

The operator is responsible for the safe function of the ventilation system. He has to ensure that the smoke detectors are always operational and properly maintained, including all controlling components and systems.

The smoke detector must be tested at least once a year in order to ensure that it performs reliably over long time periods. Without maintenance the sensor will become soiled sooner or later, depending on environmental conditions, and will eventually trigger an alarm, i.e. a false alarm.

All types will give a specific "maintenance due" signal at a contamination level of 70 % (display flashes, contamination relay drops out).

The smoke detector is equipped with a 2-digit digital contamination indicator, allowing maintenance according to demand. The smoke detector must be replaced at a contamination level 70 % or higher. The contact provided for this "contamination" signal should be connected to the automation station.

2. Maintenance and repair work

Before starting maintenance work, it must be clarified with the staff whether the unit needs to remain responsive to smoke while work is in progress. If a brief shutdown cannot be cannot be tolerated for operational reasons, measures must be taken to prevent a shutdown. If necessary, a bridge can be placed over the alarm contact for this purpose. After completion of maintenance work, any such bridge must be removed, and a complete functional test of all system components must be carried out. Any defects found must be rectified immediately. Every maintenance check must be documented in a report, and the results must be entered in the operation manual and signed by the operator in charge.

Caution:
Before opening the housing, disconnect all supply voltages. The housing may only be opened by a qualified electrician. Supply and switching voltage ratings must be observed

Please observe the following symbols on the device:
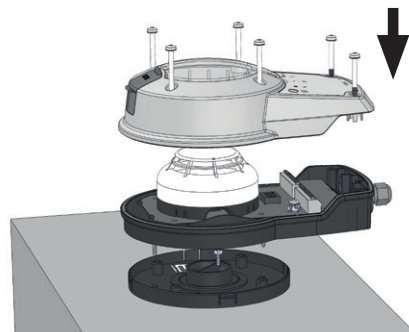
Caution – voltage

Turn voltage off before working on equipment.

Please follow the instructions.

The following work is required and can only be carried out by us or by our authorized technicians:

1. The smoke detector can be accessed by removing the cover.

2. The detector can be removed by turning it on the base by about 20° to the left. The detector must be replaced by a new detector if it has reached the contamination limit (indicator >70 %) or if the prescribed standard replacement period has expired, whichever is earlier.

3. The following must also be cleaned:
   • the cover
   • the TurboTube measuring tube
   • the inner housing

4. Check the electrical connections, tightening the terminals as necessary. Make a visual inspection of and clean the electrical circuit board as well as the inner housing as necessary. Check all gaskets.

5. Assemble all components, observing the specified torque of 1.2 Nm for screws.

6. Perform a functional test by triggering the smoke detector with Oppermann test spray.

7. Check with the operator about the function of downstream systems and components, such as:
   • Turning off of fans
   • Closing of flaps
   • Notification to the building automation system
   • When checking network failure and recovery, does the detector return to its normal function and does it unlock again from the "smoke alarm" state and return to its normal function when the alarm has been reset? Does the detector return to the alarm state and lock up if the smoke alarm persists?
   • The detector can be released by pressing the reset button or briefly disconnecting the voltage.
   • Release and approve for operation.

Dimensions

Dimensions in mm